

Physics worksheet – Friction

Q1 A 5-kg box slides on a horizontal plane. Its speed decreases 1.5 ms^{-1} in a second. Calculate (a) the force of friction on the box and (b) the coefficient of friction.

(a) $F = ma = 5 \times 1.5 = 7.5 \text{ N}$

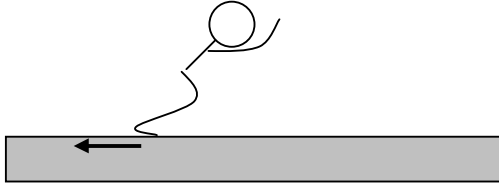
(b) $\mu = \frac{F}{N} = \frac{F}{mg} = \frac{7.5}{5 \times 9.8} \approx 0.15$

Q2 A 5-kg box slides down a plane inclined at 30° to the horizontal at constant speed. Calculate (a) the force of friction on the box and (b) the coefficient of friction.

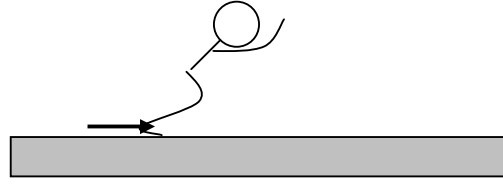
(a) $F = mg \sin \theta = 5 \times 9.8 \times \sin 30^\circ = 24.5 \text{ N}$

(b) $\mu = \frac{F}{N} = \frac{F}{mg \cos \theta} = \frac{24.5}{5 \times 9.8 \times \cos 30^\circ} \approx 0.58$

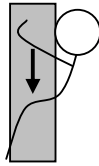
Q3 Draw an arrow to show the force exerted by your feet on the ground due to friction when you take a forward leap.



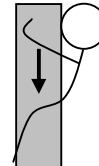
Q4 Draw an arrow to show the force exerted by the ground on your feet due to friction when you take a forward leap.



Q5 Draw an arrow to show the force exerted by your hands on a vertical pole due to friction when you slide down the pole at constant speed.

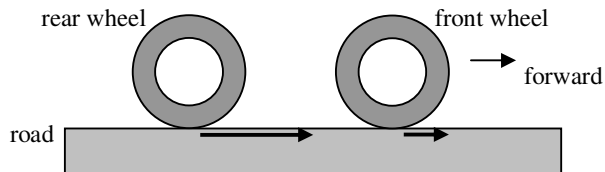


Q6 Draw an arrow to show the force exerted by your hands on a vertical pole due to friction when you climb up the pole.

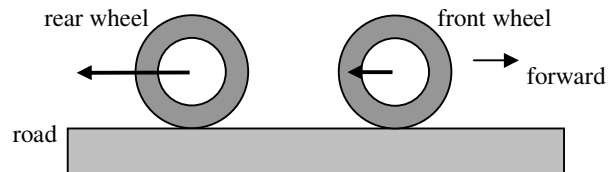


Consider air resistance and rolling resistance from Q7 to Q11, use the length of an arrow to show the relative strength of a force.

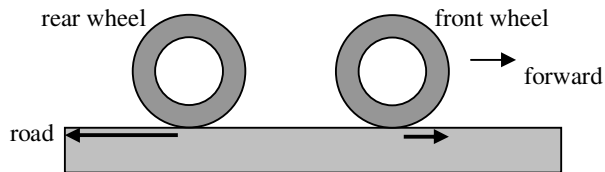
Q7 Draw an arrow to show the force exerted by each tyre on the road due to friction when a motorcycle slows down by braking the rear wheel.



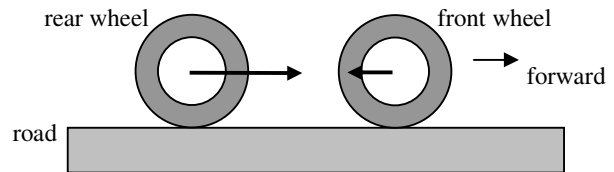
Q8 Draw an arrow to show the force exerted by the road on each tyre due to friction when a motorcycle slows down by braking the rear wheel.



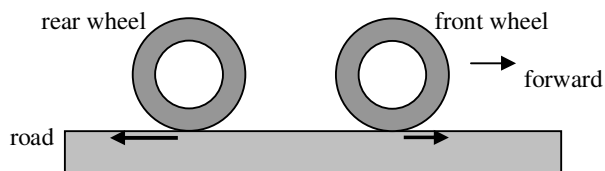
Q9 Draw an arrow to show the force exerted by each tyre on the road due to friction when a motorcycle speeds up.



Q10 Draw an arrow to show the force exerted by the road on each tyre due to friction when a motorcycle speeds up.



Q11 Draw an arrow to show the force exerted by each tyre on the road due to friction when a motorcycle cruises at constant speed against air resistance and rolling resistance.



Q12 Draw an arrow to show the force exerted by the tyres on the road due to friction when a car travels at a roundabout at constant speed, assuming that there is no air resistance or rolling resistance.

